MIDPENINSULA REGIONAL OPEN SPACE DISTRICT

2018 Greenhouse Gas Inventory Report

June 2019

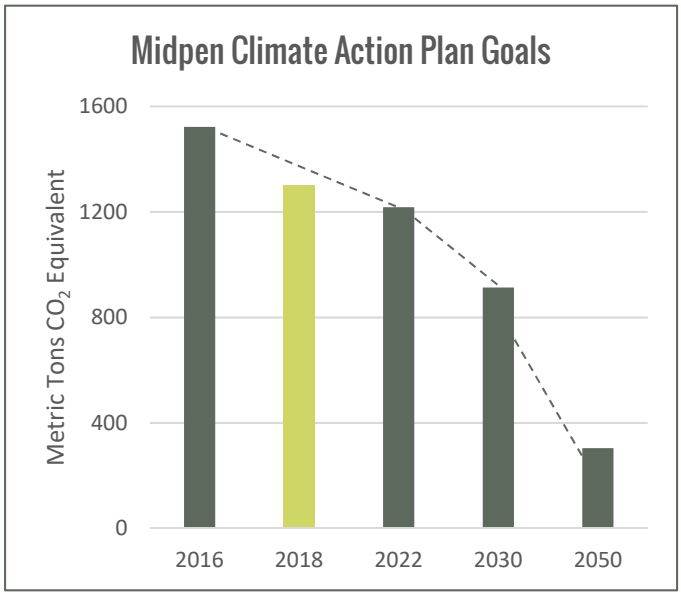
First fueling with low-carbon renewable diesel made from agricultural by-products in September 2018.

Summary

This report summarizes Midpen's greenhouse gas emissions as an agency for the year 2018.

Key findings:

- Midpen is ahead of schedule to reach our first Climate Action Plan goal of reducing administrative greenhouse gas emissions 20% by 2022.
- Midpen's administrative greenhouse gas emissions decreased by 14% from 2016 to 2018.
- This progress is encouraging and shows that effort and investment in the Climate Action Plan can yield measurable results. However, reductions will get harder in the coming years as all of the "low hanging fruit" changes are made.



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Introduction

Midpen's Board adopted the Climate Action Plan in October 2018 to reduce the agency's carbon footprint and ensure that, in line with our mission to protect the environment in perpetuity, we are doing our part to act on climate change. The Climate Action Plan commits to reducing administrative greenhouse gas (GHG) emissions **20% below 2016 baseline by 2022, 40% by 2030, and 80% by 2050**, in line with California's climate change goals and the Paris Climate Agreement. The Climate Action Plan lists dozens of changes Midpen can make across sectors to reduce GHG emissions.

The Climate Action Plan includes an inventory of Midpen's baseline GHG emissions for the year 2016. Going forward, Midpen will conduct a GHG Inventory every two years to measure progress towards the GHG reduction goals and assess the effectiveness of Climate Action Plan items that are implemented. This report summarizes Midpen's GHG

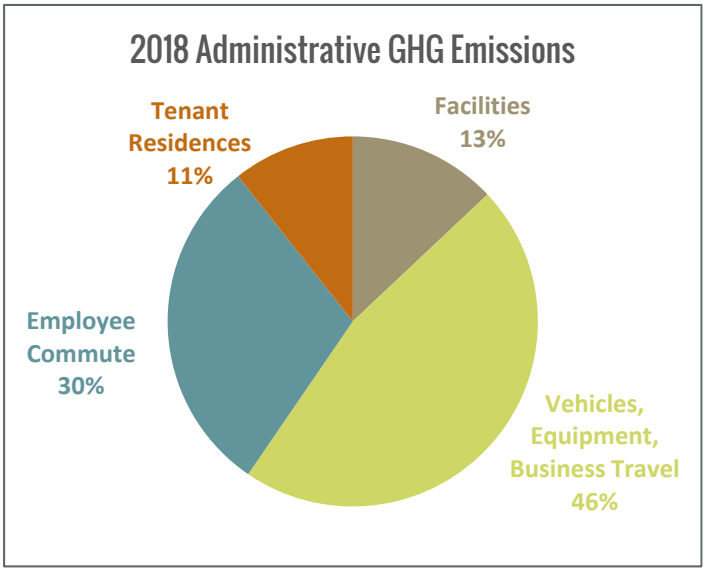
Key Terms/Acronyms

GREENHOUSE GAS (GHG): Gases that cause climate change, such as carbon dioxide, methane, and nitrous oxide, named for their warming "greenhouse effect" on the atmosphere

METRIC TON OF CARBON DIOXIDE EQUIVALENT ($MTCO_2E$): Standard unit of measurement for greenhouse gases

ADMINISTRATIVE EMISSIONS: Midpen GHG emissions from administration/operations (vehicles, commuting, facilities, residences) for which Midpen set greenhouse gas reduction goals

Inventory for the year 2018. This data collection process and report will be replicated every two years going forward and presented to the Board and the public.



Midpen's GHG emissions fall into six main sectors: 1) vehicles/equipment/business travel, 2) employee commute, 3) facilities, 4) tenant residences, 5) livestock, and 6) visitor transportation. The first four sectors are grouped together and defined as "administrative emissions" – emissions that come directly from Midpen administration and operations, over which Midpen has significant influence. The GHG reduction goals focus on the four administrative emissions sectors. Vehicles, equipment, and business travel is the largest administrative emissions sector, making up nearly half of Midpen's carbon footprint. Employee commute is the second largest administrative emissions sector, followed by facilities and tenant residences. Livestock and visitor transportation are defined as "non-administrative emissions" – emissions that are related to Midpen activities, but over which Midpen has less control. Non-administrative emissions are not included in the GHG reduction goals, but Midpen will track these emissions every two years in the GHG Inventory and work to reduce them as well.

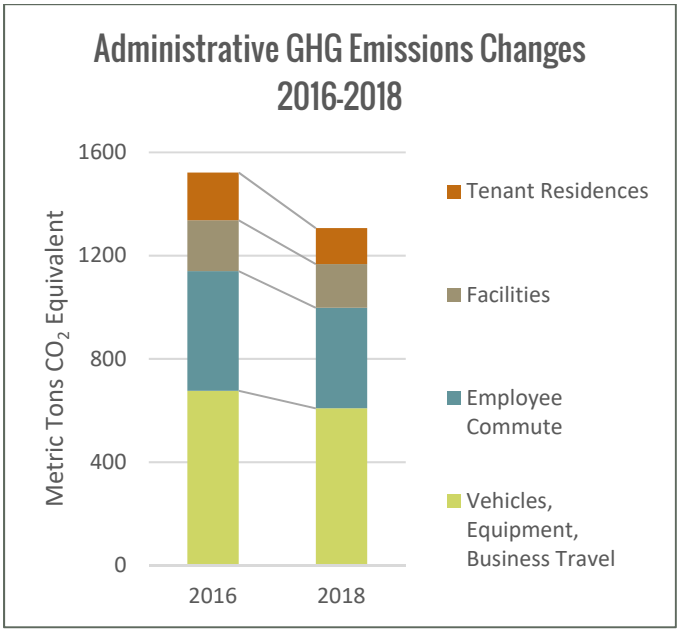
Significant reductions were not expected in the 2018 GHG Inventory since the Climate Action Plan was not adopted until October 2018 and only two Climate Action Plan items were implemented in 2018 (changing to renewable diesel and purchasing carbon offsets for flights). The 2018 GHG Inventory showed a larger reduction than expected due to the implementation of renewable diesel and carbon offsets for flights, along with regional electricity getting cleaner and a greater share of employees working compressed or remote schedules and commuting via carpool, bike, public transit, and electric vehicle.

The following sections summarize overall GHG Inventory findings and detail changes in emissions by sector. The final section, "Moving Forward," discusses Climate Action Plan items that have already been implemented in 2019 or are planned for implementation in Fiscal Year 2019-2020, along with challenges and opportunities to consider in pursuit of Midpen's GHG reduction goals.

2018 Greenhouse Gas Inventory Findings

Overall: 14% Decrease in Administrative Emissions

Overall, the 2018 GHG Inventory found that **administrative GHG emissions decreased 14% from 2016 to 2018**. Midpen's administrative GHG emissions total for 2018 was 1,307 metric tons of carbon dioxide equivalent ($MTCO_2E$), 215 $MTCO_2E$ less than in 2016. A metric ton of carbon dioxide equivalent is the standard unit of measurement for greenhouse gases. This decrease was driven by a 10% reduction in vehicles/equipment/business travel emissions, a 16% reduction in employee commute emissions, a 14% reduction in facilities emissions, and a 25% decrease in tenant residences emissions. These emissions are detailed in the "2018 Greenhouse Gas Inventory by Sector – Administrative Emissions" section.



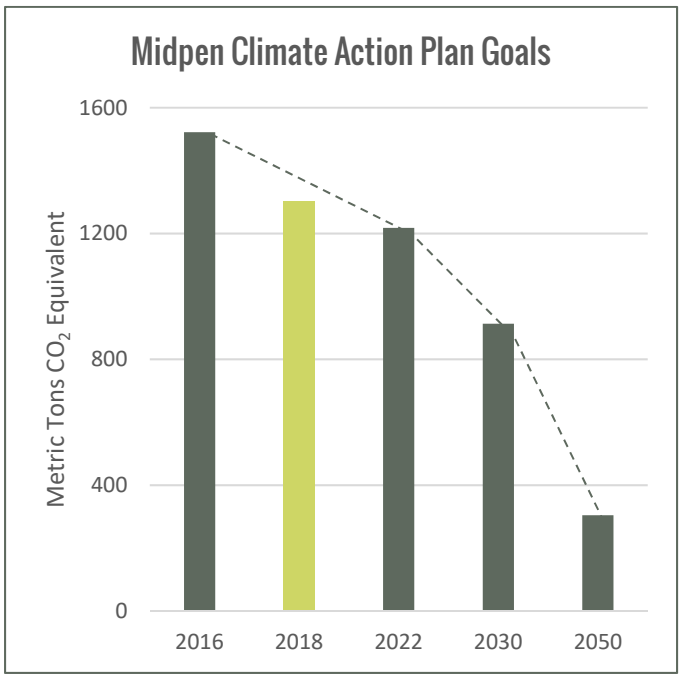
Administrative GHG Emissions Changes 2016-2018

ADMINISTRATIVE GHG EMISSIONS ($MTCO_2E$)	2016	2018	CHANGE
Vehicles, Equipment, Business Travel	676	608	-10%
Employee Commute	463	389	-16%
Facilities	197	170	-14%
Tenant Residences	185	139	-25%
Administrative GHG Emissions Total	**1,522**	**1,307**	**-14%**

There are also non-administrative GHG emissions related to Midpen activities but that Midpen has less control over, such as livestock and visitor transportation to preserves. These emissions are described in the "Appendix 1: 2018 Greenhouse Gas Inventory by Sector – Non-Administrative Emissions" section.

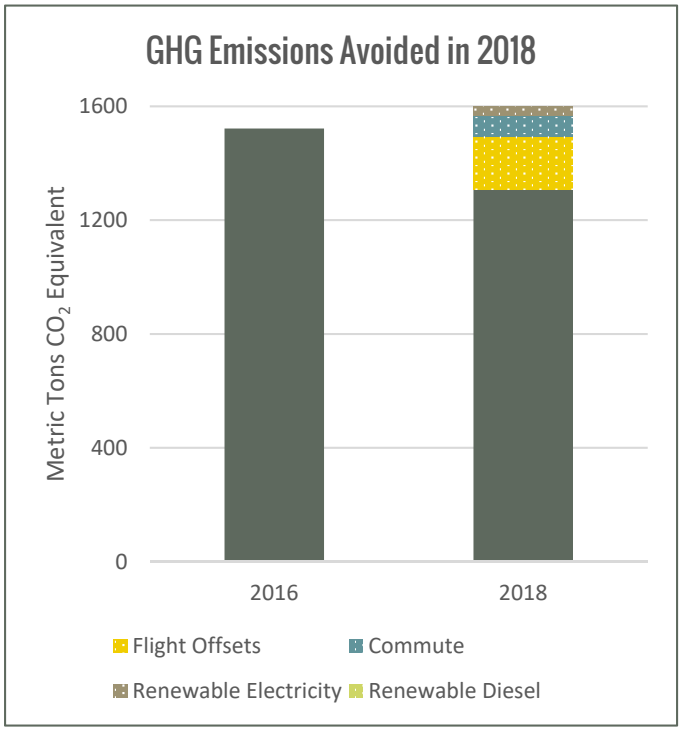
Progress Towards Climate Action Plan Goals

As part of the Climate Action Plan, Midpen set voluntary goals to reduce administrative GHG emissions 20% below 2016 baseline by 2022, 40% by 2030, and 80% by 2050. The 2018 GHG Inventory shows that, by already reducing administrative emissions 14% in two years, **Midpen is ahead of schedule to achieve the 20% by 2022 goal**. If the current rate of reduction continues, Midpen would reduce emissions 28% by 2022. This progress is encouraging, and will help build momentum and demonstrate that effort and investment in the Climate Action Plan can yield measurable results. However, reductions will get harder in the coming years as all of the "low hanging fruit" changes are made.



Greenhouse Gas Emissions Avoided

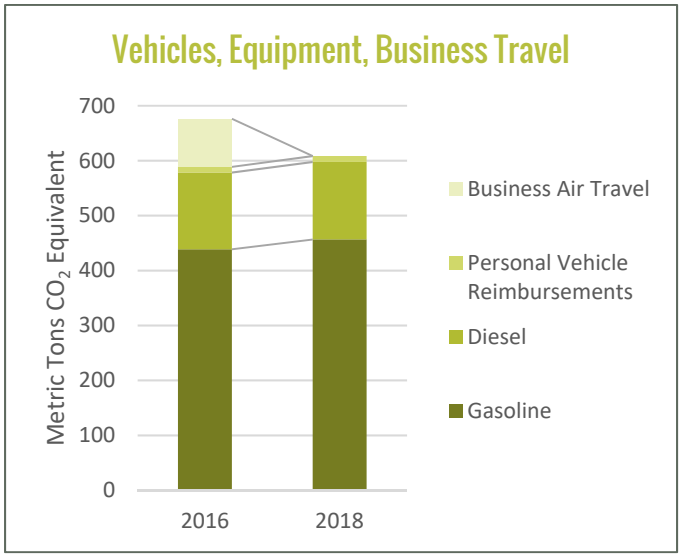
In addition to showing that emissions decreased from 2016 to 2018, the GHG Inventory also shows that administrative **emissions would have *increased* by 9% from 2016 to 2018 if changes had not been made by Midpen and regional electricity providers**. These avoided GHG emissions were achieved in four areas. First, Midpen purchased carbon offsets for business flights (see "Business Air Travel" section for a discussion of the complexities of carbon offsets). Second, Midpen achieved significant reductions in commute emissions because more employees worked compressed and telework schedules and chose alternative commute modes. Third, Midpen benefitted from our regional electricity getting cleaner as most Midpen facilities and residences were automatically enrolled in 50% renewable electricity in 2017. Fourth, Midpen began purchasing renewable diesel made from agricultural by-products for the field office fuel tanks in September 2018 (this reduction is too small to see on the chart, but still worth highlighting). Without these changes, Midpen's administrative emissions would have increased by 9%, or 347 $MTCO_2E$, from 2016 to 2018.



2018 Greenhouse Gas Inventory by Sector - Administrative Emissions

Vehicles, Equipment, Business Travel: 10% Decrease in Emissions

Vehicles, maintenance equipment, and business travel are the largest source of Midpen's administrative emissions, making up 46% of 2018 emissions. Emissions in this sector decreased by 10% from 2016 to 2018. This decrease was driven by two changes: switching the field office fuel tanks to renewable diesel made from agricultural by-products in September 2018, and purchasing carbon offsets for business flights.



Gasoline: 4% Increase in Emissions

Gasoline emissions increased by 4% from 2016 to 2018. This increase was driven by an increase in gasoline fuel consumption. This increase is not surprising, as Midpen's staff, vehicle fleet, and land that needs to be patrolled and maintained continue to grow. Gasoline continues to be one of Midpen's largest and most challenging emissions sources.

Diesel: 1% Increase in Emissions

Diesel emissions increased by 1% from 2016 to 2018. This increase was driven by a 21% increase in diesel fuel consumption, which was almost entirely offset by switching from regular diesel to renewable diesel in September 2018, implementing Climate Action Plan item #V1. Renewable diesel is a biofuel made from agricultural byproducts such as plant waste and animal fats. It has a 68% lower lifecycle carbon footprint than regular fossil fuel diesel. The benefits of renewable diesel will be even more pronounced in future years' GHG Inventories, because renewable diesel was only implemented in the last three months of 2018. By using renewable diesel instead of regular diesel just for that short time, Midpen has already saved 28 $MTCO_2E$.

Personal Vehicle Reimbursements: 3% Increase in Emissions

Reimbursements for employees using their personal vehicle for work are a very small portion of Midpen's emissions. Personal vehicle use increased by 3% from 2016 to 2018.

Business Air Travel: All Emissions Offset

Business air travel emissions were counted as zero in 2018 because Midpen purchased carbon offsets for all business flights, implementing Climate Action Plan item #V14. Flights are the only emissions source for which the Climate Action Plan recommends purchasing carbon offsets. This is because there is no viable alternative to reduce emissions from flights other than staff not attending out of state conferences. The carbon offsets Midpen purchased are verified and contribute to projects that reduce

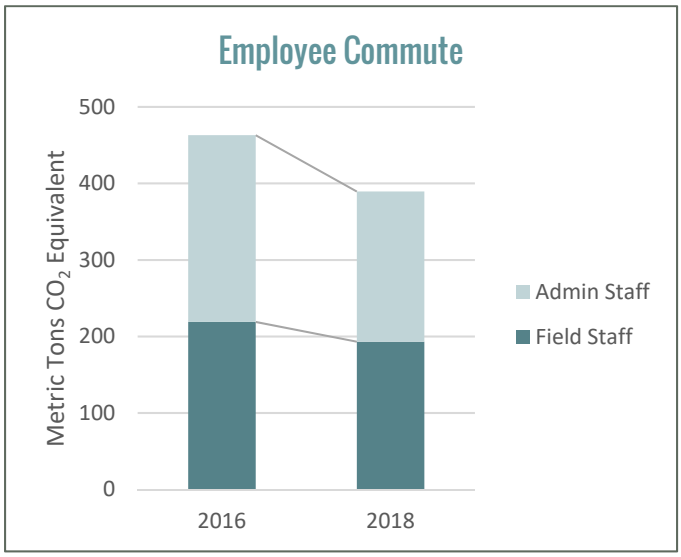
carbon emissions. However, we recognize that purchasing carbon offsets is not an ideal way to reduce agency emissions, and that is why carbon offsets are not considered in any other sector.

Business flights in 2018 generated 165 $MTCO_2E$, which would have made up 11% of the total GHG Inventory if carbon offsets had not been purchased. This is a significant portion of total emissions, nearly doubling the emissions from flights in 2016. If business flights were counted in the GHG Inventory, total emissions would only have decreased by 3% (instead of decreasing by 14%) and vehicle sector emissions would have increased by 14% (instead of decreasing by 10%). Because of these complexities, excluding business flights from both the 2016 and 2018 totals provides a more direct comparison of other emissions sectors. Excluding business flights from the Inventories, total emissions decreased by 9% from 2016 to 2018 and vehicle sector emissions increased by 3% from 2016 to 2018. However, GHG accounting protocols state that if an agency purchases verified offsets, those emissions should be counted as zero. Therefore, business flights are counted as zero in the 2018 GHG Inventory.

Performance Indicators

VEHICLES, EQUIPMENT, BUSINESS TRAVEL INDICATORS	2016	2018
Vehicle fleet average miles per gallon (excluding service/commercial trucks)	15.8	16.5
Portion of annual fuel used that is renewable	0%	6%
Annual miles flown for business travel	50,000	93,000

Employee Commute: 16% Decrease in Emissions



Employee commuting continues to be Midpen's second-largest sector, making up 30% of 2018 administrative emissions. Employee commute emissions decreased by 16% from 2016 to 2018. This decrease was driven by two trends: more employees working a compressed 9/80 or weekly telecommute schedule, and more employees commuting via carpool, bike, public transit, or electric vehicle. The portion of employees working a compressed 9/80 schedule rose from 32% to 44% from 2016 to 2018, and the portion of administrative employees working a weekly telecommute schedule rose from 9% to 16%. The portion of employees who always drive alone stayed consistent at about 82%, but the portion of employees who always use alternative modes increased from 2% to 10%. The new incentives for commuting via carpool, bike, public transit, or electric vehicle that will be implemented in summer 2019 should increase the use of alternative modes further. However, driving alone is the only option for many employees because of the high cost of housing and limited public transportation options in the area, especially for field staff who commute to rural field offices.

2018 Employee Commute Trips by Mode

COMMUTE MODE	ADMINISTRATIVE STAFF	FIELD STAFF
Drive alone – non-electric vehicle	78%	91%
Drive alone – electric vehicle	6%	0%*
Carpool	8%	8%
Bike	6%	1%
Caltrain	2%	N/A

**It is not possible for most field staff to commute via electric vehicle until EV chargers are installed at field offices.*

Midpen employees collectively commuted nearly 1.5 million miles in 2018, 84% of which was driven alone. The average employee commutes 38 miles round-trip each day, or roughly 8,500 miles per year. In addition to the impact on the environment, these commutes are challenging for employees and for the organization. 50% of administrative staff and 34% of field staff report being dissatisfied with their commutes; 17 employees surveyed said they "could barely keep it up." Providing flexible schedule options and incentivizing alternative commuting has significant benefits for employee morale and retention in addition to reducing emissions.

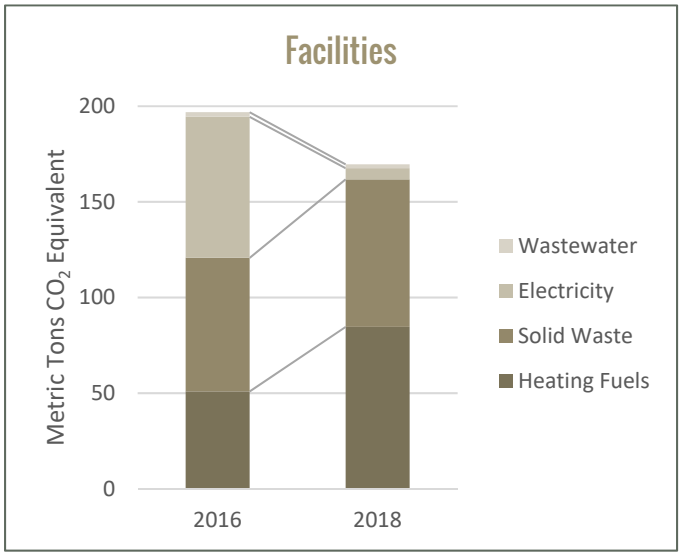
One potential issue with the employee commute data is that, because the GHG Inventory is a snapshot in time, there were fewer employees in the 2018 GHG Inventory (165 FTE) than the 2016 GHG Inventory (178 FTE) despite long-term growth in Midpen staff. If the number of employees had stayed the same in the 2018 Inventory, commute emissions would have decreased by 9%. This confirms that increases in flexible schedules and alternative commuting explain a majority of the decrease in commute emissions.

Performance Indicators

EMPLOYEE COMMUTE INDICATORS	2016	2018
Total drive-alone employee vehicle miles traveled	1,350,784	1,134,689
Portion of employees who always drive alone to work	83%	82%
Portion of employees who work a compressed 9/80 schedule	32%	44%
Portion of administrative employees who telecommute weekly	9%	16%

Facilities: 14% Decrease in Emissions

The facilities sector, making up 13% of 2018 administrative emissions, includes electricity, heating fuels (natural gas and propane), solid waste (trash, recycling, and compost), and wastewater. Emissions in this sector decreased by 14% from 2016 to 2018. This decrease was driven by electricity in the region getting cleaner, as nearly all buildings in San Mateo and Santa Clara Counties were automatically enrolled in 50% renewable electricity in 2017.



Electricity: 92% Decrease in Emissions

Electricity emissions decreased by 92% from 2016 to 2018. This huge decrease in electricity emissions happened despite a 31% increase in electricity use. Emissions decreased because almost all Midpen facilities were automatically enrolled in 50% renewable electricity from Peninsula Clean Energy and Silicon Valley Clean Energy in 2017. These "community choice energy" providers are public Joint Powers Authorities that were created in San Mateo and Santa Clara Counties, respectively, in 2016 as the official electricity providers for the counties. The clean energy providers purchase power, while PG&E retains responsibility for power delivery and billing. This concept is an innovation in the energy sector that lets consumers choose between the default 50% renewable electricity, or "opt up" to 100% renewable electricity. Midpen "opted up" almost all facilities to 100% renewable electricity in January 2019, so the benefits of these new clean energy providers will be even more pronounced in future years' GHG Inventories as electricity emissions will be essentially zero. Midpen's automatic enrollment in 50% renewable electricity for the year 2018 saved 42 $MTCO_2E$ compared to if we had still been on PG&E power. The only facility not currently served by the clean energy providers is the Skyline Field Office due to confusion over its proximity to the county line. Staff have been in contact with the clean energy providers trying to get the Skyline Field Office enrolled in renewable electricity.

Heating Fuels: 66% Increase in Emissions

Heating fuel emissions increased by 66% from 2016 to 2018. This increase was driven by a significant increase in natural gas use in the Administrative Office, perhaps due to a cooler wetter winter affecting the HVAC system's operation. Propane use at the field offices remained about the same.

Solid Waste: 10% Increase in Emissions

Solid waste emissions increased by 10% from 2016 to 2018. Midpen sent 46 tons of trash to landfill in 2018. From 2016 to 2018, the volume of trash increased by 10%, the volume of recycling increased by 72%, and the volume of compost decreased by 31%. A vast majority of Midpen's solid waste comes from maintenance projects in the field, so the type of projects happening in a given year has a big impact on the amount and type of waste Midpen produces. Midpen's waste diversion rate (the portion of waste going to recycling or compost rather than landfill) increased from 34% in 2016 to 37% in 2018.

Wastewater: 20% Decrease in Emissions

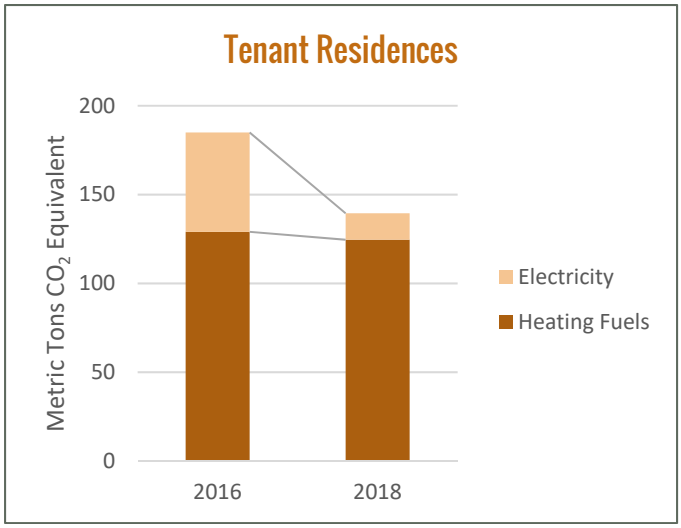
Wastewater treatment is a very small portion of Midpen's emissions. Wastewater emissions decreased by 20% from 2016 to 2018, from 2.5 $MTCO_2E$ to 2.0 $MTCO_2E$. The decrease was because more people are being served by the area's wastewater treatment plant, so Midpen's portion of emissions is less.

Performance Indicators

FACILITIES INDICATORS	2016	2018
Administrative office electricity use per square foot (annual kWh/SQFT)	11.3	16.9
Field office electricity use per square foot (annual kWh/SQFT)	5.4	5.1
Portion of electricity from renewable sources	33%	50%
Solid waste diversion rate (% diverted from landfill)	34%	37%

Tenant Residences: 25% Decrease in Emissions

The tenant residences sector, making up 11% of 2018 administrative emissions, includes electricity and heating fuels (natural gas and wood) for the 40 residences Midpen owns. Emissions in this sector decreased by 25% from 2016 to 2018. This decrease was driven by the electricity in the region getting cleaner, as nearly all buildings in Midpen's boundary were automatically enrolled in 50% renewable electricity in 2017.



It is important to note that the data quality is poor for tenant residences because Midpen only pays the energy bills for a few of the 40 residences. The emissions calculations are based on regional energy use averages by square footage and heat source. While the tenant residence emissions figure is a rough estimate, emissions can still be compared from year to year because the same methods were used.

Electricity: 73% Decrease in Emissions

Electricity emissions decreased by 73% from 2016 to 2018. This decrease was driven by electricity in the region getting cleaner, as nearly all buildings in San Mateo and Santa Clara Counties were automatically enrolled in 50% renewable electricity from Peninsula Clean Energy and Silicon Valley Clean Energy, respectively, in 2017. These clean energy providers are described in the "Facilities" section. The Inventory assumes that no tenants opted out of 50% renewable electricity or opted up to 100% renewable electricity. In future years, the tenant residences data could be improved by obtaining energy bills from tenants or asking them what level of renewable electricity they are purchasing.

Heating Fuels: 3% Decrease in Emissions

Emissions from burning natural gas and wood for heating decreased by 3% from 2016 to 2018. Wood makes up about 70% of the emissions from residence heating fuels because it has a much higher carbon footprint than natural gas or electric heat. Burning wood also produces particulate matter that causes air quality problems and respiratory illness in the region.

Performance Indicators

TENANT RESIDENCES INDICATORS	2016	2018
Portion of tenants purchasing highest renewable electricity option from utility	0%	TBD
Portion of tenant residences using wood for heating	52%	48%

Moving Forward

The 2018 GHG Inventory paints an optimistic picture of Midpen's ability to reach our GHG reduction goals in 2022 and beyond. On top of that, Midpen has already implemented a number of Climate Action Plan items in 2019 that were not captured in this GHG Inventory that will reduce emissions further:

- New incentives for commuting via carpool, bike, public transit, or electric vehicle were approved and will be implemented in summer 2019
- All Midpen facilities except SFO were upgraded to 100% renewable electricity in January 2019
- Land and Facilities and Visitor Services continue to purchase electric maintenance equipment, bikes, and ATVs to reduce fossil fuel consumption where possible
- Most lighting in the Administrative Office was upgraded to energy-efficient LED lighting
- Administrative Office waste reduction was enabled by adding compost and expanding recycling

In addition, the following items are included in the Fiscal Year 2019-2020 Budget and Action Plan:

CLIMATE ACTION PLAN ITEM	BUDGET	DEPARTMENT
Commute-4: Create incentives for employees commuting via carpool, public transit, bike, or walking	$46,000	Administrative Services
Commute-5/Vehicles-3: Feasibility assessment for electric vehicle chargers at field offices	$0 (Staff time only)	Land and Facilities
Commute-6: Create intranet page with commute resources and carpool database	$0 (Staff time only)	Administrative Services
Commute-7: Update Administrative Office electric vehicle charging cost	$0 (Staff time only)	Administrative Services
Commute-9: Create emergency ride home safeguard for employees commuting via alternative means	$0 (Staff time only)	Administrative Services
Facilities-2: Install solar panel system at Skyline Field Office	$150,000	Land and Facilities
Facilities-3: Upgrade lighting at field offices to LED	$20,000	Land and Facilities
Facilities-6: Implement office waste reduction measures	$0 (Staff time only)	Land and Facilities
Livestock-2: Partner with San Mateo Resource Conservation District to develop plan to increase carbon sequestration	$25,000	Natural Resources
Residences-1/Residences-6: Request energy data from tenants and encourage tenants to purchase 100% renewable electricity	$0 (Staff time only)	Land and Facilities
Vehicles-4: Acquire and test electric equipment, bikes, or ATVs for maintenance	$20,000	Land and Facilities
Vehicles-5/Vehicles-6: Replace one retiring hybrid administrative vehicle with an electric vehicle; transfer hybrid vehicle to field office	$38,500	Land and Facilities
Vehicles-9/Vehicles-10: Acquire and test electric motorcycles, bikes, or ATVs for patrol	$20,000	Visitor Services
Vehicles-14: Purchase carbon offsets for business flights	$1,000	Natural Resources

All of these changes are likely to contribute to emissions reductions beyond the 14% reduction already achieved in this GHG Inventory. It is our hope that the next GHG Inventory for the year 2020 shows the positive impact of these changes and demonstrates Midpen's continued progress towards achieving the GHG reduction goals and leading by example on climate change. However, reductions will get progressively harder in the coming years as all of the "low hanging fruit" changes are made. Continued effort and investment in the Climate Action Plan will be required to reach our ambitious goals.

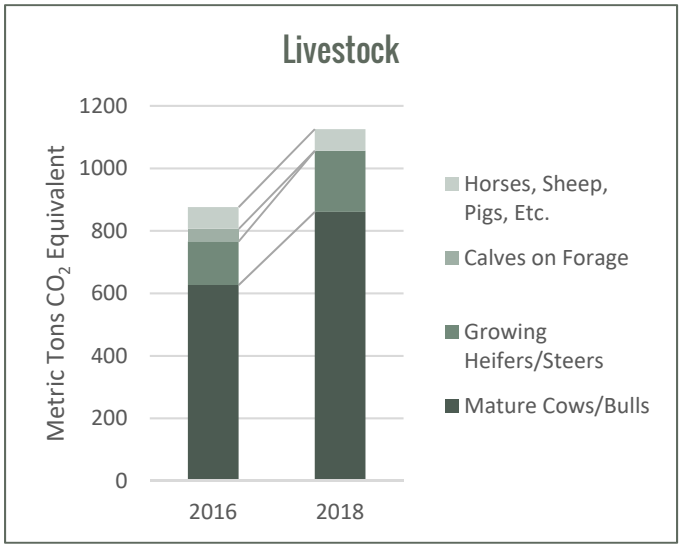
Appendix 1: 2018 Greenhouse Gas Inventory by Sector – Non-Administrative Emissions

In addition to administrative GHG emissions, there are also non-administrative GHG emissions related to Midpen activities but that Midpen has less control over. Livestock emissions increased by 28% from 2016 to 2018 due to more cattle on the land. Visitor transportation emissions were not included in the 2016 baseline GHG Inventory, but were calculated for 6 preserves in the 2018 GHG Inventory. The visitor transportation figure is *not* an estimate of total emissions and is best viewed as a rough estimate for the 6 preserves that have car counters. These sectors represent opportunities to reduce emissions above and beyond Midpen's administrative GHG reduction goals. There are also emissions from Midpen contractors and volunteers, but no data is available to include those sectors in the GHG Inventory.

ADMINISTRATIVE GHG EMISSIONS ($MTCO_2E$)	2016	2018	CHANGE
Vehicles, Equipment, Business Travel	676	608	-10%
Employee Commute	463	389	-16%
Facilities	197	170	-14%
Tenant Residences	185	139	-25%
Administrative GHG Emissions Total	**1,522**	**1,307**	**-14%**
NON-ADMINISTRATIVE GHG EMISSIONS ($MTCO_2E$)	2016	2018	CHANGE
Livestock	876	1,126	+28%
Visitor Transportation – 6 Preserves	-	3,803	-

Livestock: 28% Increase in Emissions

Livestock emissions increased by 28% from 2016 to 2018. This increase was driven by more cows and steers grazing on Midpen lands due to the end of California's 2011-2017 drought. Ruminant animals like cattle produce and release methane, a strong greenhouse gas, when they digest grass. This methane is difficult to calculate precisely because it varies depending on region, diet, weight, and more. The Intergovernmental Panel on Climate Change estimates the uncertainty for cattle emissions is ± 20% to ± 50%.



Midpen uses conservation grazing to manage vegetation for fire protection, control invasive plants, help sustain the local agricultural economy, and foster the region's rural heritage. Without grazing, Midpen would not be able to manage the same acreage of grassland and would instead use fuel-powered mowers. Livestock emissions are not included in the administrative scope because livestock provide other environmental benefits and exist within a complex biological system. There is evidence that certain grazing regimes may increase soil carbon, perhaps even enough to offset some portion of the cattle's methane emissions. A complete picture of livestock's impact on the climate should include both methane emissions and increases in soil carbon due to grazing and land management. Midpen recently began a project with the San Mateo Resource Conservation District to quantify the carbon sequestration of different rangeland management practices. As Midpen implements those practices in the future, livestock emissions can be reduced by measurably increasing soil carbon sequestration in grazed areas.

Performance Indicators

LIVESTOCK INDICATORS	2016	2018
Number of animals with high enteric emissions (cattle)	374	480
Number of animals with low enteric emissions (horses, sheep, pigs, etc.)	177	177
Annual additional landscape carbon sequestration due to grazing ($MTCO_2E$)	TBD	TBD
Percent of annual livestock emissions offset by carbon sequestration projects	0%	0%

Visitor Transportation: Emissions Estimates for 6 Preserves Added to Inventory

To start, this is *not* an estimate of total emissions from visitor transportation. It is an estimate of emissions for the 6 preserves that have car counters installed, so total visitor transportation emissions are likely higher. Visitor transportation to those 6 preserves was estimated to produce 3,803 $MTCO_2E$ in 2018. The estimate includes Rancho San Antonio, by far Midpen's busiest site. However, the estimate does not include busy Mount Umunhum or the 17 other open preserves that do not have car counters.

Car counter data was used to estimate total vehicle trips in 2018 to the 6 preserves with car counters. Data from the 2017 Preserve Use Survey was used to calculate average trip distance. Together, these sources estimate 11 million visitor miles driven in 2018 to the 6 preserves with car counters. It is important to note that the car counters do not count visitors arriving at other parking lots in that preserve or visitors arriving by bike, foot, or transit. Finally, the Preserve Use Survey did not ask about transportation mode, so it is assumed that all visitors drove to the preserves.

2018 Visitor Mileage and Emissions Estimates for Preserves with Car Counters

PRESERVE	VISITOR MILES DRIVEN	EMISSIONS ($MTCO_2E$)
Rancho San Antonio	6,630,736	2,275
Purisima Creek Redwoods – North Ridge	1,429,864	491
Windy Hill – Lower Lot	972,004	334
El Corte de Madera	880,552	302
Monte Bello	607,856	209
Russian Ridge – Mindego Hill	563,108	193

Visitor Services is working to improve visitation data by installing more car counters and hiring an intern to study visitation at Mount Umunhum. There is already a car counter at Mount Umunhum, but that site is not included in this Inventory because the Preserve Use Survey happened before Mount Umunhum was open. As Midpen gains better visitation statistics, emissions can be calculated for additional preserves in the 2020 GHG Inventory to move towards an estimate of total visitor transportation emissions. The upcoming Rancho San Antonio Multimodal Access Study will explore non-motorized mobility and transit options that could help reduce emissions from visitor transportation. Finally, by preserving open space close to home, Midpen provides a lower emissions alternative to faraway parks.

Performance Indicators

VISITOR TRANSPORTATION INDICATORS	2016	2018
Total visitor miles driven to and from preserves – 6 preserves	-	11,000,000
Percent of visitor trips made via transit, bike, or electric vehicle	-	TBD

Appendix 2: Detailed Table of Greenhouse Gas Emissions Changes 2016-2018

ADMINISTRATIVE GHG EMISSIONS ($MTCO_2E$)	2016	2018	CHANGE
Vehicles, Equipment, Business Travel	**676**	**608**	**-10%**
Gasoline	439	457	+4%
Diesel	140	141	+1%
Personal Vehicle Reimbursements	10	11	+3%
Business Air Travel	88	0*	-100%
Employee Commute	**463**	**389**	**-16%**
Administrative Staff	244	196	-20%
Field Staff	219	193	-12%
Facilities	**197**	**170**	**-14%**
Electricity	74	6	-92%
Heating Fuels	51	85	+66%
Solid Waste	70	77	+10%
Wastewater	2.5	2.0	-20%
Tenant Residences	**185**	**139**	**-25%**
Electricity	56	15	-73%
Heating Fuels	129	125	-3%
Administrative GHG Emissions Total	**1,522**	**1,307**	**-14%**
NON-ADMINISTRATIVE GHG EMISSIONS ($MTCO_2E$)	2016	2018	CHANGE
Livestock	**876**	**1,126**	**+28%**
Mature Cows/Bulls	627	861	+37%
Growing Heifers/Steers	139	195	+40%
Calves on Forage	40	0	-100%
Horses	53	52	-2%
Other Livestock	17	18	+4%
Visitor Transportation – 6 Preserves	**-**	**3,803**	**-**

**Midpen purchased carbon offsets for 165 $MTCO_2E$ of business flight emissions in 2018. See "Business Air Travel" section for a discussion of the complexities of carbon offsets.*

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